* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the call setup method of a network system that two or more line switching networks were connected to IP packet network.
[0002]
[Description of the Prior Art] Integration with a voice network and a data network is quickly developed with progress of network technology in recent years. There is a voice-over IP (VoIP) network which realizes speech communication which led IP packet network (for example, Internet) as one of the networks integrated. A VoIP network consists of two or more contacts (gateway unit) which connect IP packet network, two or more line switching networks (for example, telephone network), and a line switching network and IP packet network, respectively. Each line switching network has the line switching machine which held the singular number or two or more terminal units, and a line switching machine is connected to IP packet network through the singular number or two or more gateway units.
[0003] When the call which led IP packet network between line switching networks is conventionally set up in a VoIP network, operation of the following shown in drawing 13 is performed. In the example shown in drawing 13 , the line switching network by the side of call origination is equipped with line switching machine 1b which held terminal 1a. Line switching machine 1b is connected to IP packet network through the gateway unit 11. On the other hand, the line switching network by the side of a call in is equipped with line switching machine 2b which held terminal 2a. Line switching machine 2b is connected to IP packet network through each gateway units 21, 22, and 23.
[0004] In drawing 13 , when terminal unit 1a becomes a call origination terminal, terminal unit 2a becomes a call-in terminal and a call is set up between terminal unit 1a and terminal unit 2a, terminal unit 1a performs call origination, and inputs into line switching machine 1b by making the number to be dialed (partner first-move number) of terminal unit 2a into a call-in terminal number. Then, line switching machine 1b transmits the call setup message containing a call-in terminal number to a gateway unit 21.
[0005] If a call setup message is received, from the call-in terminal number contained in the call setup message, a gateway unit 11 will ask for the IP address of the destination, and will transmit IP packet which contains a call setup message in IP address ** for which it asked. In this example, the IP address of a gateway unit 21 is set up as an IP address corresponding to a partner first-move number. For this reason, transmitted IP packet is transmitted to the gateway unit 21 which corresponds to the destination through IP packet network.
[0006] A gateway unit 21 tends to transmit the call setup message contained in this IP packet to line switching machine 2b, if IP packet is received. However, when all the circuits that connect a gateway unit 21 and line switching machine 2b are using it or the obstacle has occurred in the circuit concerned, a gateway unit 21 cannot transmit a call setup message to line switching machine 2a. In this case, a gateway unit 21 notifies the connection improper notice (the inside of drawing the completion message of release) of a purport which cannot carry out the call in of the call setup message to the line switching machine by the side of a call in through IP packet network to the gateway unit by the side of call origination (gateway unit 11).

[0007] After transmitting IP packet before the predetermined time passed, when a connection improper notice is received, a gateway unit 11 asks for the IP address of other gateway units (gateway units 22 and 23) connected with line switching machine 2b, and transmits IP packet which contains a call setup message in this IP address **. In the example shown in drawing 13 , IP packet is transmitted to a gateway unit 22.
[0008] However, when a gateway unit 22 cannot transmit a call setup message to line switching machine 2b, either, a connection improper notice is given to a gateway unit 11 like the above. When a connection improper notice is received in a predetermined time, a gateway unit 11 asks for the IP address of other gateway units (gateway unit 23) again, and transmits IP packet which contains a call setup message to a gateway unit 23.
[0009] When it judges with the ability of a gateway unit 23 to transmit a call setup message to line switching machine 2b, a call setup message is extracted from IP packet, and a call setup message is transmitted to line switching machine 2b based on the call-in terminal number contained in this call setup message.
[0010] Line switching machine 2b will call to terminal unit 2a, if a call setup message is received. Then, a call is set up between terminal unit 1a and terminal unit 2a through some procedures.
[0011] Each gateway units 21, 22, and 23 do not transmit a notice to that effect to the gateway unit by the side of call origination, when the call setup message which received from the gateway unit by the side of call origination can be transmitted to the line switching machine by the side of a call in. After the gateway unit by the side of call origination transmitted IP packet, when a connection improper notice is not received in a predetermined time, it recognizes it as what a call setup message is delivered to the line switching machine by the side of a call in from the gateway unit by the side of a call in, and does not perform processing which others wear and asks for the IP address of a side gateway unit.
[0012]
[Problem(s) to be Solved by the Invention] With the conventional technology mentioned above, the gateway unit by the side of call origination transmits IP packet containing a call setup message to the gateway unit which surely has an IP address corresponding to a call-in terminal number in the beginning.
[0013] Thus, with the conventional technology, the gateway unit by the side of call origination was not able to transmit IP packet which chooses the optimal thing out of these gateway units, and contains a call setup message, even when two or more gateway units which may turn into a gateway unit by the side of a call in existed.
[0014] Moreover, the gateway unit by the side of call origination broadcasts again IP packet which contains a call setup message to other gateway units, when waiting and a connection improper notice are received for the response from the gateway unit which transmitted IP packet. Such retransmission-of-message processing is repeatedly performed for every gateway unit until the gateway unit which the gateway unit which can transmit a call setup message to the line switching machine by the side of a call in is found, or should broadcast IP packet again is lost.
[0015] Therefore, when, as for the gateway unit by the side of call origination, the gateway unit which transmits IP packet first cannot transmit a call setup message to the line switching machine by the side of a call in, the same IP packet is transmitted repeatedly. For this reason, the load to IP packet network may have risen and delay may have produced IP packet within the net to the message and data which are transmitted.
[0016] The purpose of this invention is offering the call setup method of the network system which can mitigate the load of IP packet network by preventing retransmitting a message to the call setup message from the line switching network by the side of call origination repeatedly.
[0017]
[Means for Solving the Problem] this invention was performed as follows in order to attain the above-mentioned purpose. That is, this invention is the call setup method of the network system equipped with the gateway group which connects the 1st gateway which connects the 1st line switching network, IP packet network, and the 1st line switching network and IP packet network, the 2nd line switching network, and the 2nd line switching network and IP packet network, respectively.
[0018] By this call setup method, the 1st line switching network becomes a call origination side, the

2nd line switching network becomes a call-in side, and when the call which led IP packet network between the 1st line switching network and the 2nd line switching network is set up, the following procedures are performed.

[0019] Since the gateway which can be transmitted to the 2nd line switching network is specified for this call setup message when a call setup message is received from the 1st line switching network, the 1st gateway turns a call-in propriety inquiry message to a gateway group, and transmits to IP packet network.

[0020] IP packet network multicasts as a gateway group the call-in propriety inquiry message which received from the 1st gateway unit. Each gateway in a gateway group transmits a call-in propriety inquiry response message to the 1st gateway unit, when a call-in propriety inquiry message is received and it is in the state which can be transmitted to the 2nd line switching network about a call setup message.

[0021] The 1st gateway unit chooses the gateway which should transmit a call setup message out of the gateway which transmitted the call-in propriety inquiry response message, and transmits a call setup message to the selected gateway unit.

[0022] With the above procedure, the gateway by the side of call origination (the 1st gateway) can transmit a call setup message to the gateway which can transmit a call setup message to the 2nd line switching network certainly. For this reason, the case which broadcasts a call setup message again is lost like before.

[0023] Therefore, it can prevent that the load of IP packet network rises or delay of data or a message arises with IP packet network by performing retransmission-of-message processing of a call setup message repeatedly.

[0024]

[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained with reference to a drawing.

[The 1st operation gestalt]

<Composition of a VoIP network system> Drawing 1 is the block diagram showing the example of the VoIP network system (henceforth a "VoIP system") by the operation gestalt of this invention. In drawing 1 , as for the VoIP system, the 1st line switching network, the 2nd line switching network, and the 3rd line switching network are connected to IP packet network IN.

[0025] Specifically, the 1st line switching network is equipped with the line switching machine 10 which held terminal unit 1A, and the line switching machine 10 is connected to IP packet network IN through each gateway unit 101,102. Moreover, the 2nd line switching network is equipped with the line switching machine 20 which held terminal unit 2A, and the line switching machine 20 is connected to IP packet network IN through each gateway unit 201,202,203.

[0026] Moreover, the 3rd line switching network is equipped with the line switching machine 30 which held terminal unit 3A, and the line switching machine 30 is connected to IP packet network IN through each gateway unit 301,302. Furthermore, the line switching machine 20 and the line switching machine 30 are connected through the trunk line C (the example in an ISDN circuit is shown), and the 2nd line switching network and the 3rd line switching network are connected.

[0027] Each terminal units 1A, 2A, and 3A are telephone, a personal computer, a workstation, a mobile computer, etc. Each line switching machines 10, 20, and 30 are the private branch exchanges (PBX:Private Branch Exchange). IP packet networks IN are the Internet and intranet, and are equipped with two or more routers etc. The router 110 connected to each gateway unit 101,102, the router 210 connected to each gateway unit 201,202,203, and the router 310 connected to each gateway unit 301,302 are shown in drawing 1 .

[0028] A router 110 is a source node about each gateway unit 101,102, a router 210 is a source node about each gateway unit 201,202,203, and a router 310 is a source node about each gateway unit 301,302. Each router 110,210,310 is mutually connected through nodes, such as other routers, in IP packet network IN.

[0029] <Composition of a gateway unit> Next, the composition of the gateway unit in the VoIP system by the operation gestalt is explained. Each gateway unit illustrated by drawing 1 has the same composition. For this reason, a gateway unit 101 is explained as an example.

[0030] Drawing 2 is the block diagram of a gateway unit. The gateway unit 101 is equipped with a

central control unit 31, main storage (main memory : MM) 32, and the compression sign / extension decode equipment 33 (CODEC) in drawing 2 .
[0031] A central control unit 31 consists of CPU (Central Processing Unit), storage which recorded various kinds of programs, a communication controller, etc., and when CPU performs each program, it performs call control, data transmission control, etc. This central control unit 31 functions as the read-out section of this invention, an editorial department, the transmitting section, and a receive section.
[0032] MM32 is used as a working area of a central control unit 31. MM32 holds the code-IP address-gateway conversion table (henceforth a "conversion table") 34. This conversion table is equivalent to the table of this invention.
[0033] Drawing 3 is explanatory drawing of a conversion table 34. As shown in drawing 3 , the conversion table 34 holds two or more records which consist of each item of a "code", "an IP address (multicast address)", and "gateway classification."
[0034] CODEC33 generates the packet data stored in a packet by carrying out compression coding of the data received from the line switching machine. On the other hand, CODEC33 generates decode and the elongated data for the packet data contained in IP packet which received from IP packet network IN.
[0035] <Function of a multicast router> Next, the function of each router 110,210,310 set up as a multicast router is explained. Drawing 4 is the block diagram of each router 110,210,310. Since each router 110,210,310 has the same composition, a router 210 is explained as an example.
[0036] The router 210 is equipped with a central control unit 41 and main storage 42. It consists of CPU, storage, a communication controller, etc. (ROM, RAM, etc.), and a central control unit 41 performs control about transmission of IP packet by performing various kinds of control programs stored in storage.
[0037] For example, a central control unit 41 sends out the IP packet from the sending-out port corresponding to the destination with reference to the destination IP address of the packet, if IP packet is received. When the destination IP address of IP packet is a multicast address at this time, a central control unit 41 sends out the IP packet concerned, respectively from the sending-out port applicable to the singular number or two or more destinations which have participated in the predetermined multicasting group.
[0038] With this operation form, each gateway unit 201,202,203 by which the direct file is carried out to the router 210 is set up as a gateway unit which can participate in the multicasting group corresponding to a router 210.
[0039] Main storage 42 is used as a working area of the program execution by the central control unit 41. Main storage 42 holds the address management field 43 for a central control unit 41 managing the state of the participation/secession to the multicasting group of each gateway unit 201,202,203. The IP address of the gateway unit which has participated to the multicasting group is stored in the address management field 43.
[0040] Hereafter, management of the multicasting group by the central control unit 41 of a router 210 is explained. Drawing 5 (A) is explanatory drawing of the participating procedure to the multicasting group of a gateway unit, and drawing 5 (B) is explanatory drawing of the secession procedure to the multicasting group of a gateway unit.
[0041] As shown in drawing 5 (A), a router 210 transmits periodically the message (HMQ message) for asking the participation to a multicasting group by IP address "224.0.0.1 (ALL SYSTEMS-GROUP)" ** as the group address. A HMQ message is transmitted to each gateway unit 201,202,203 which can participate in a multicasting group by this <1>.
[0042] Each gateway unit 201,202,203 (central control unit 31) will judge whether it participates to a multicasting group, if a HMQ message is received. A HMQ message is disregarded when it judges with each gateway unit 201,202,203 not participating in a multicasting group at this time.
[0043] For example, each gateway unit 201,202,203 judges with not participating in a multicasting group, when it is in the state where neither data nor a message can be transmitted to the line switching machines 20 when all the circuits connected to the line switching machine 20 are using it or the line failure has occurred.
[0044] On the other hand, each gateway unit 201,202,203 transmits the response message (HMR

message) of a HMQ message including an own IP address to a router 210, when participating to a multicasting group <2>. In addition, the case where only a gateway unit 203 participates in a multicasting group is illustrated by drawing 5 (A).

[0045] If a HMQ message is transmitted, the central control unit 41 of a router 210 will start the time check of the timer for HMR message reception, and will wait to transmit a HMR message from each gateway unit 201,202,203.

[0046] Then, a central control unit 41 stores in the address management field 43 the IP address included in the HMR message, when a HMR message is received before the above-mentioned timer became a time-out. Then, a central control unit 41 transmits as the destination the IP address (gateway unit 203) in which the IP packet was stored to the address management field 43, when IP packet multicasting was specified to be is received (it multicasts).

[0047] As shown in drawing 5 (B), when the gateway unit 203 which has participated in the multicasting group secedes from a multicasting group and secession is determined, the message (LEAVE message) of a purport which secedes from a multicasting group is sent out to IP address "224.0.0.2 (ALL ROUTERS-GROUP)" **. A LEAVE message is transmitted to a router 210 by this <3>.

[0048] The central control unit 41 of a router 210 will eliminate all the IP addresses stored in the address management field 43, if a LEAVE message is received. By this, a gateway unit 203 will be seceded from a multicasting group.

[0049] Then, a central control unit 41 transmits the message (GS-Q message) for checking that the gateway which has participated in the multicasting group does not exist by group address "224.0.0.1" **. A GS-Q message is transmitted to each gateway unit 201,202,203 by this <4>.

[0050] The central control unit 31 of each gateway unit 201 transmits a HMR message to a router 210, when a GS-Q message is received and it continues maintaining the participating state to a multicasting group <refer to 5: drawing 6 >. On the other hand, a central control unit 31 disregards this GS-Q message, when continuing maintaining the secession state from a multicasting group.

[0051] The central control unit 31 of a router 210 stores in the address managed table 43 the IP address included in the HMR message, when it receives before the waiting timer for reception of a HMR message according to the GS-Q message became a time-out. The participating state of the gateway unit which has participated in the multicasting group is maintained ****** [before a router 210 receives a LEAVE message] by this.

[0052] <Operation at the time of a call setup> Next, the example of operation at the time of the call setup in the VoIP system mentioned above is explained. In order to simplify explanation, the following conditions are assumed by the VoIP structure of a system shown in drawing 1 .

(1) The code of the line switching machine 10 is [the code of "722" and ********** 30 of the code of "711" and the line switching machine 20] "733." Moreover, the terminal number of terminal unit 1A is [the terminal number of "200" and terminal 3A of the terminal number of "100" and terminal unit 2A] "300."

(2) In connecting a call to terminal unit 2A from terminal unit 1A, it dials from a terminal unit 1 with partner first-move number (terminal number of call-in terminal) =722-200. Then, it connects with IP packet network IN via a gateway unit 101 or a gateway unit 102, and after that, a call minds any of a gateway unit 201, a gateway unit 202, and the gateway 203 they are, and is connected to terminal 2A of the line switching machine 20.

(3) When a call is connected to terminal unit 3A from terminal unit 1A, dial with partner first-move number =733-300 in terminal unit 1A (if a code + terminal number is dialed, it will connect with the partner point).

(4) It connects by the trunk line C, and the line switching machine 30 and the line switching machine 20 can connect terminal unit 3A and terminal unit 2A, even if it does not go via IP packet network IN. (In connecting a call to terminal unit 2A from terminal unit 3A, it dials with partner first-move number =722-200.) However, a trunk line is used only when terminal unit 3A and terminal unit 2A cannot be connected through IP packet network.

[0053] In addition, in the example of operation explained below, a gateway unit 101 is equivalent to the 1st gateway (gateway) of this invention, a gateway unit 201,202,203 is equivalent to the gateway group of this invention, and a gateway unit 301,302 is equivalent to the 2nd gateway group of this

invention.
[0054] (1st example of operation) Drawing 6 and drawing 7 are the sequence diagrams showing the 1st example of operation at the time of a call setup. In drawing 6 , with IP packet network IN, each router 110,210,310 transmits a HMQ message to the gateway unit group (gateway unit group which may serve as a call-in side gateway unit) corresponding to the group address periodically, and asks the participation to a multicasting group.
[0055] Moreover, when it changes into the state where neither data nor a message can be transmitted to a line switching machine, to the router by which the direct file is carried out to self, the gateway unit which has participated in the multicasting group is transmitting a LEAVE message, and secedes from a multicasting group.
[0056] In drawing 6 , the gateway unit 202,203 has participated in the multicasting group among the gateway units 201,202,203 connected to the line switching machine 20 by operation mentioned above. In this state, terminal unit 1A becomes a call origination terminal, terminal unit 2A becomes a call-in terminal, a call is set up among both, and it is assumed that speech communication is performed.
[0057] In this case, the user of terminal unit 1A dials the number to be dialed "722-200" to terminal unit 2A as a partner first-move number. This partner first-move number is inputted into the line switching machine 10 (1).
[0058] The line switching machine 10 will transmit the call setup message (partner first-move number : 722 -200) as which the sending-out direction of a call setup message recognizes it to be that it is IP packet network IN side by well-known technique, and is specified by the ISDN (IntegratedService Digital Network) protocol in it to a gateway unit 101, if a partner first-move number is received (2).
[0059] ** [a gateway unit's 101 reception of a call setup message (partner first-move number : 722 - 200) / perform / processing shown in the flow chart of drawing 8 / the central control unit 31 of a gateway unit 101] (3)
[0060] That is, as shown in drawing 8 , a central control unit 31 will extract the IP address (multicast address) corresponding to the partner first-move number "722-200" contained in the call setup message, if a call setup message is received from the line switching machine 10 (S01) (S02).
[0061] That is, refer to the conversion table 34 (refer to drawing 3) held at main storage 32 for a central control unit 31. Then, a central control unit 31 extracts the IP address "XXX.XXX.XXX.220" by which it corresponded to the code "722" of the line switching machine contained in the partner point message "722-200", and gateway classification was set as the "main gateway."
[0062] Next, a central control unit 31 edits IP packet containing the call-in propriety inquiry message which makes the destination the extracted multicast address, and sends it out to IP packet network IN (S03).
[0063] It is a message for asking whether a call-in propriety inquiry message can transmit a call setup message to the line switching machine 20 to each gateway unit (this example each gateway unit 201,202,203) which may turn into a gateway unit by the side of a call in, and the artificer is calling it "QUERY."
[0064] Drawing 9 (A) is format explanatory drawing of an arrival-of-the-mail propriety inquiry message. As shown in drawing 9 (A), the arrival-of-the-mail propriety inquiry message is equipped with the field which stores information size length, and the field which stores gateway classification (0:main gateway, 1:reserve gateway).
[0065] A central control unit 31 edits IP packet by giving predetermined IP header to the above-mentioned arrival-of-the-mail propriety inquiry message. The extracted multicast address "XXX.XXX.XXX.220" is set to IP header.
[0066] then, if a central control unit 31 sends out IP packet containing an arrival-of-the-mail propriety inquiry message to IP packet network IN, it will start the time check by the waiting timer for reception of the response message (call-in propriety inquiry response message: -- the artificer is calling it "QUERY CONNECT") of an arrival-of-the-mail propriety inquiry message (S04)
[0067] It returns to drawing 6 , and the call-in propriety inquiry message transmitted from the gateway unit 101 is transmitted in the inside of IP packet network IN through a router 110, and is received by the router 210. If the central control unit 41 of a router 210 recognizes it as specification

of multicasting of the destination IP address of IP packet which received, it will take out the IP address stored in the address management field 43, and will transmit a call-in propriety inquiry message to the gateway unit which makes this IP address the destination.
[0068] A call-in propriety inquiry message is transmitted to each gateway unit 202,203 which has participated in the multicasting group by this. Namely, a call-in propriety inquiry message is multicasted as each gateway unit 201,202,203 ** from a gateway unit 101, and it will be in the state where it is received by only each gateway unit 202,203 (4).
[0069] Then, from self, each gateway unit 202,203 transmits a call-in propriety inquiry response message to a gateway unit 101, when it can judge and perform whether the call in of data or the message can be carried out to the line switching machine 20, and when it cannot do, it disregards this call-in propriety inquiry message.
[0070] In drawing 6 , it judged with the ability of each gateway unit 202,203 to carry out the call in of the message etc. to the line switching machine 20, and IP packet including a call-in propriety inquiry response message is transmitted to the gateway unit 101.
[0071] Drawing 9 (B) is format explanatory drawing of an arrival-of-the-mail propriety inquiry response message. As shown in drawing 9 (B), the arrival-of-the-mail propriety inquiry response message is equipped with the field which stores information size length, and the field which stores gateway classification (0:main gateway, 1:reserve gateway).
[0072] The central control unit 31 of a gateway unit 101 transmits IP packet which contains the call setup message which set up (refer to S05;Y: drawing 8) and the transmitting agency address (source address) of the IP packet as the destination when IP packet including a call-in propriety inquiry response message is received, before the waiting timer for reception became a time-out to the gateway unit by the side of the call in applicable to the destination (refer to S09: drawing 8).
[0073] That is, a central control unit 31 chooses the gateway unit (the response was the earliest) which made the call-in propriety inquiry response message reach a gateway unit 101 first as a gateway unit by the side of a call in, and transmits a call setup message to (7) and the gateway unit concerned (8). In the example of drawing 7 , a gateway unit 202 is chosen and IP packet which contains a call setup message to a gateway unit 202 is transmitted.
[0074] If a gateway unit 202 receives IP packet, the central control unit 31 of a gateway unit 202 will extract a call setup message from IP packet which received, and will transmit this call setup message to the line switching machine 20 based on the call-in terminal number "200" (number of terminal unit 2A) contained in the call setup message.
[0075] The line switching machine 20 will edit the call setup receptionist message corresponding to a call setup message, if a call setup message is received. The edited call setup receptionist message is transmitted to a gateway unit 202 (11). Moreover, in the line switching machine 20, an opposite voice line of contact is caught and RBT (Ring Back Toon) is connected by this (12). On the other hand, the line switching machine 20 calls to terminal unit 2A (13).
[0076] If a gateway unit 202 receives a call setup receptionist message from the line switching machine 20, the central control unit 31 of a gateway unit 202 will edit IP packet by giving IP header to a call setup receptionist message. Then, IP packet in which the call setup receptionist message was contained is transmitted to a gateway unit 101 through IP packet network IN (14).
[0077] If a gateway unit 101 receives IP packet, from IP packet which received, the central control unit 31 of a gateway unit 101 will extract a call setup receptionist message, and will transmit the extracted call setup receptionist message to the line switching machine 10 (15).
[0078] By the way, RBT connected to the opposite voice line of contact is passed to a gateway unit 202 (16). Then, the central control unit 31 of a gateway unit 202 edits IP packet which carries out compression coding of the RBT by CODEC33, and contains RBT by which compression coding was carried out, and transmits to a gateway unit 101 (17).
[0079] If a gateway unit 101 receives a RBT voice packet through IP packet network IN, the central control unit 31 of a gateway unit 101 decodes the voice packet data in the RBT voice packet which received to RBT by CODEC33. RBT by which decode was carried out is transmitted to the line switching machine 10 through the TDM interface of a gateway unit 101, and is passed to the circuit circuit of terminal unit 1A through the network circuit of the line switching machine 10 (18).
[0080] On the other hand, if the line switching machine 20 calls terminal unit 2A, the ringer of (13)

and terminal unit 2A will carry out singing (19). On the other hand, if the user of terminal unit 2A performs response operation, (20) and a reply signal will be inputted into the line switching machine 20 from terminal unit 2A (21). Then, the line switching machine 20 detects the response of terminal unit 2A, edits a response message, and transmits it to a gateway unit 202 (22).

[0081] If a response message is received, the central control unit 31 of a gateway unit 202 will edit IP packet including this response message, and will transmit to IP packet network IN (23). This IP packet is received by the gateway unit 101 through IP packet network IN. The central control unit 31 of a gateway unit 101 extracts a response message from IP packet which received, and passes it to the line switching machine 10 (24).

[0082] With the call setup procedure (signaling procedure) explained above, a call is set up between terminal unit 1A and terminal unit 2A, and terminal unit 1A and terminal unit 2A will be in a state during a telephone call. Then, voice can be mutually transmitted and received between terminal unit 1A and terminal unit 2A.

[0083] (2nd example of operation) In the 1st example of operation mentioned above, when a call-in propriety inquiry message was transmitted from a gateway unit 101, the case where each gateway unit 202,203 returned a call-in propriety inquiry response message was explained.

[0084] The 2nd example of operation is **(ed) and explained to the 1st example of operation about operation when a call-in propriety inquiry response message is not returned, when a gateway unit 101 transmits a call-in propriety inquiry message. Drawing 10 is the sequence diagram showing the 2nd example of operation.

[0085] As shown in drawing 10 , the central control unit 31 of a gateway unit 101 turns a call-in propriety inquiry message to each gateway unit 201,202,203, and transmits.

[0086] Then, a central control unit 31 extracts the IP address (multicast address) corresponding to a partner first-move number from a conversion table 34, when a call-in propriety inquiry response message is not received from each gateway unit 201,202,203 (S06;N of drawing 8), by the time the waiting timer for reception became a time-out (S07 of drawing 8).

[0087] That is, a central control unit 31 corresponds to the call-in terminal number contained in the partner first-move number, and extracts the IP address "XXX.XXX.XXX.330" whose gateway classification is the "reserve gateway."

[0088] Then, a central control unit 31 edits IP packet containing the call-in propriety inquiry message which makes the destination the extracted IP address, and sends out this IP packet to IP packet network IN (S08 of drawing 8).

[0089] IP packet containing a call-in propriety inquiry message is multicasted as the reserve gateway group (gateway unit 301,302) to the main gateway unit group (gateway unit 201,202,203) by this.

[0090] That is, the IP packet concerned is transmitted to a router 310 through IP packet network IN. If the IP packet concerned is received, the central control unit 41 of a router 310 extracts the IP address stored in the address managed table 43, and multicasts IP packet containing this call-in propriety inquiry message by making the extracted IP address into the destination.

[0091] IP packet is multicasted only as each gateway unit which has participated in the multicasting group among reserve gateway unit groups by this. When having participated in the multicasting group at this time 301, for example, a gateway unit, as shown in drawing 10 , the IP packet concerned is transmitted only to a gateway unit 301.

[0092] Then, when a gateway unit 301 transmits IP packet including the call-in propriety inquiry response message corresponding to the call-in propriety inquiry message contained in IP packet, this IP packet is received by the gateway unit 101 through IP packet network IN.

[0093] Then, a gateway unit 101 transmits IP packet containing a call setup message to a gateway unit 301, as the 1st example of operation explained. A gateway unit 301 will transmit the call setup message contained in the IP packet to the line switching machine 30, if IP packet is received.

[0094] The line switching machine 30 will transmit a call setup message to the line switching machine 20 through a trunk line C based on the call-in terminal number contained in the call setup message, if a call setup message is received.

[0095] this -- the terminal unit 1A-line switching machine 10-gateway unit 101-gateway unit 301 -- the message of - line switching machine 30-line switching machine 20-terminal unit 2A and the transmission root of data are established

[0096] If a call setup message is received from the line switching machine 30, the line switching machine 20 will call terminal unit 2A like the 1st example of operation while it sends out a call setup receptionist message to the line switching machine 30.
[0097] Then, RBT (RBT voice packet), a call setup receptionist message, and a response (response message) are transmitted through the root mentioned above (refer to drawing 7), the call between terminal unit 1A and terminal unit 2A is set up and established, and speech communication is performed.
[0098] In addition, when a gateway unit 101 does not receive a call-in propriety inquiry response message for either of each gateway unit 301,302, either, in a VoIP system, processing for terminating this call setup processing (signaling procedure) is performed as that whose call setup is impossible.
[0099] <Operation of the 1st operation gestalt> According to the 1st operation gestalt, before transmitting a call setup message to the gateway unit by the side of a call in, the gateway unit by the side of call origination transmits a call-in propriety inquiry message to the gateway unit group which may serve as a gateway unit by the side of a call in, and transmits a call setup message for the gateway unit which the call-in propriety inquiry response message reached first as a gateway unit by the side of a call in.
[0100] By this, the gateway unit by the side of call origination can transmit a call setup message to the gateway unit which can transmit a call setup message to a line switching machine certainly. That is, a call setup message can be transmitted by the proper root. For this reason, the gateway unit by the side of call origination does not need to broadcast a call setup message again like before. Therefore, the load up of IP packet network by retransmitting a message to a call setup message on IP packet network repeatedly and delay of data and a message can be prevented.
[0101] Moreover, since a call setup message is transmitted to the gateway unit to which the call-in propriety inquiry response message reached the gateway unit by the side of call origination early most, a call setup message can be transmitted by the root which can transmit a message most in a short time.
[0102] In addition, with this operation gestalt, the gateway unit which the arrival-of-the-mail propriety inquiry response message reached early most is determined as a gateway unit which should transmit a call setup message. It may replace with this and the central control unit 31 of the gateway unit by the side of call origination may determine the gateway unit which should transmit a call setup message by other technique out of the gateway unit which received the call-in propriety inquiry response message.
[0103] That is, since the gateway unit by the side of call origination can determine which gateway is chosen as a trigger for the turn which the call-in propriety inquiry response message reached, those with urgency / urgency nothing of the call which occurred, or the /amount of data with much amount of data can also determine turn by it being few etc.
[0104] Moreover, with this operation form, as the reserve gateway, a gateway unit 301,302 is set up and an arrival-of-the-mail propriety inquiry message is multicasted as these gateway units 301,302. It replaces with this and only a gateway unit 301 is set up as the reserve gateway (the 2nd gateway of this invention), and when the gateway unit by the side of call origination does not receive a call-in propriety inquiry response message before the timer became a time-out, a call setup message may be made to be transmitted to a gateway unit 301.
[0105] The [2nd operation form] Next, the 2nd operation form of this invention is explained. Since the 2nd operation form has the 1st operation form and a common feature, it mainly explains difference with the 1st operation form. With the 2nd operation form, setup to each gateway units 101, 102, 201, and 202,203,301,302 shown in drawing 1 differs.
[0106] For example, if a gateway unit 101 is explained as an example, the main storage 32 (refer to drawing 2) of a gateway unit 101 will hold the IP address corresponding to the partner first-move number contained in the call setup message, when a call setup message is received from the line switching machine 10. This IP address is an IP address (for example, IP address of a gateway unit 201) of the gateway unit which should transmit a call setup message first.
[0107] If a gateway unit 101 receives a call setup message like the 1st operation gestalt when call setup processing (signaling procedure) is performed between terminal unit 1A and terminal unit 2A,